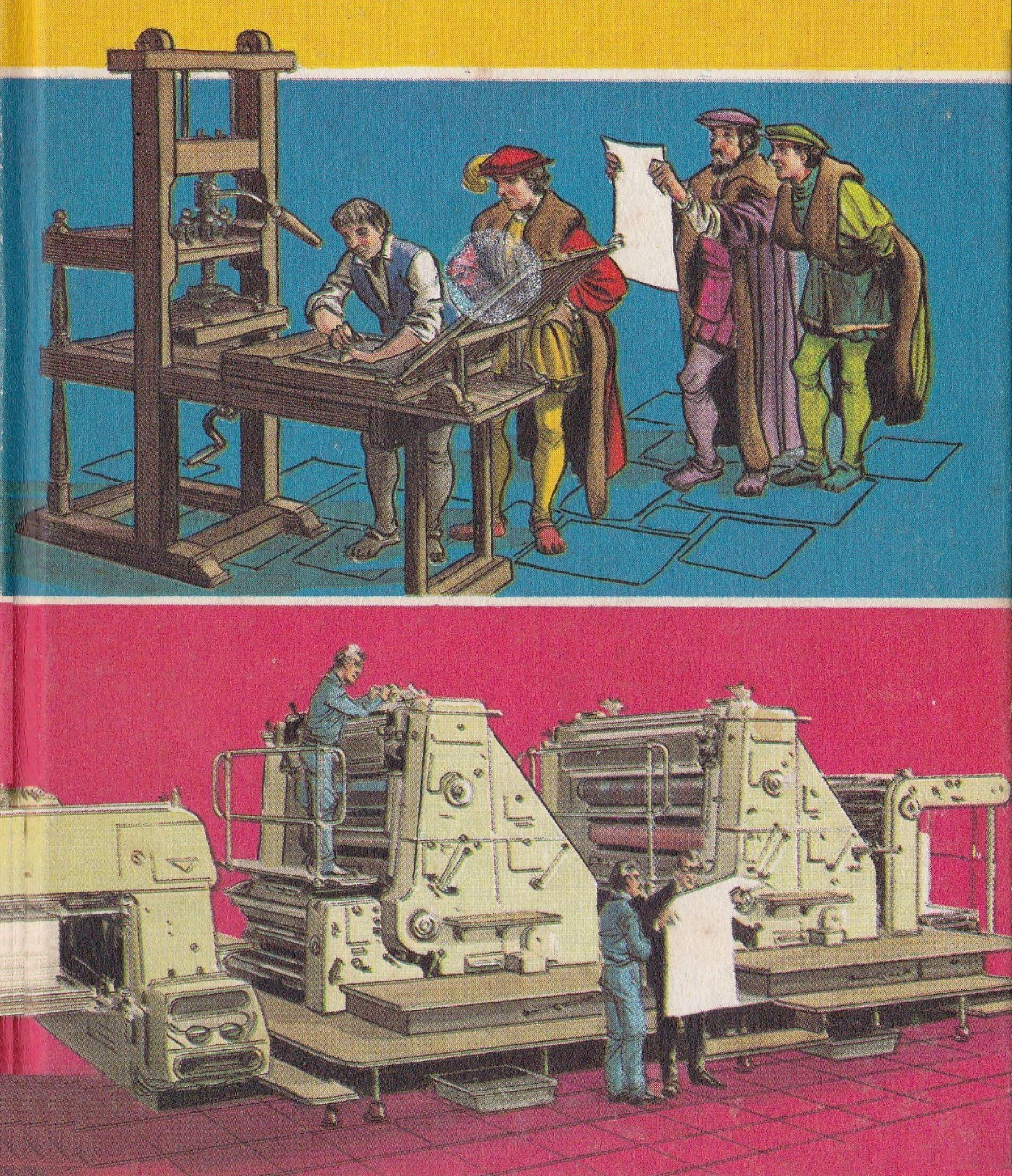
A Ladybird Achievements Book

THE STORY OF PRINTING



This beautifully illustrated book gives the whole fascinating history of printing as a means of mass communication. It describes how early man, with no more than wood and stone to work with, left his messages for future generations to read. It brings us right up to date with a brief explanation of how this book was printed. Whether you are young or not so young, it is a story well worth reading.

A Ladybird Achievements Book

Series 601

THE STORY OF PRINTING

by DAVID CAREY
with illustrations by ROBERT AYTON

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What this story is about

It is impossible to imagine what our lives would be like without any printed matter. We are surrounded by printing of every kind. This book is printed. Many thousands of copies exactly like it are being read by boys and girls in thousands of different places.

. Of course, there was a time when printing did not exist, when few people had enough education to read or write. Earlier still there was not even an alphabet.

In this book we trace the story of man's need to communicate with his fellow beings, from the earliest days when a cave-dweller scratched a picture on a stone, up to the highly technical printing processes of today. We visit ancient Egypt, the age-old civilisation of China, and Europe in the Middle Ages. We also look at the work of men like Johann Gutenberg and William Caxton the Englishman who, much later, pioneered printing in the Western World and made possible the achievements of today. It is a story full of historical interest, that has had a great effect on people's lives.

A cave-dweller scratches a picture on a stone

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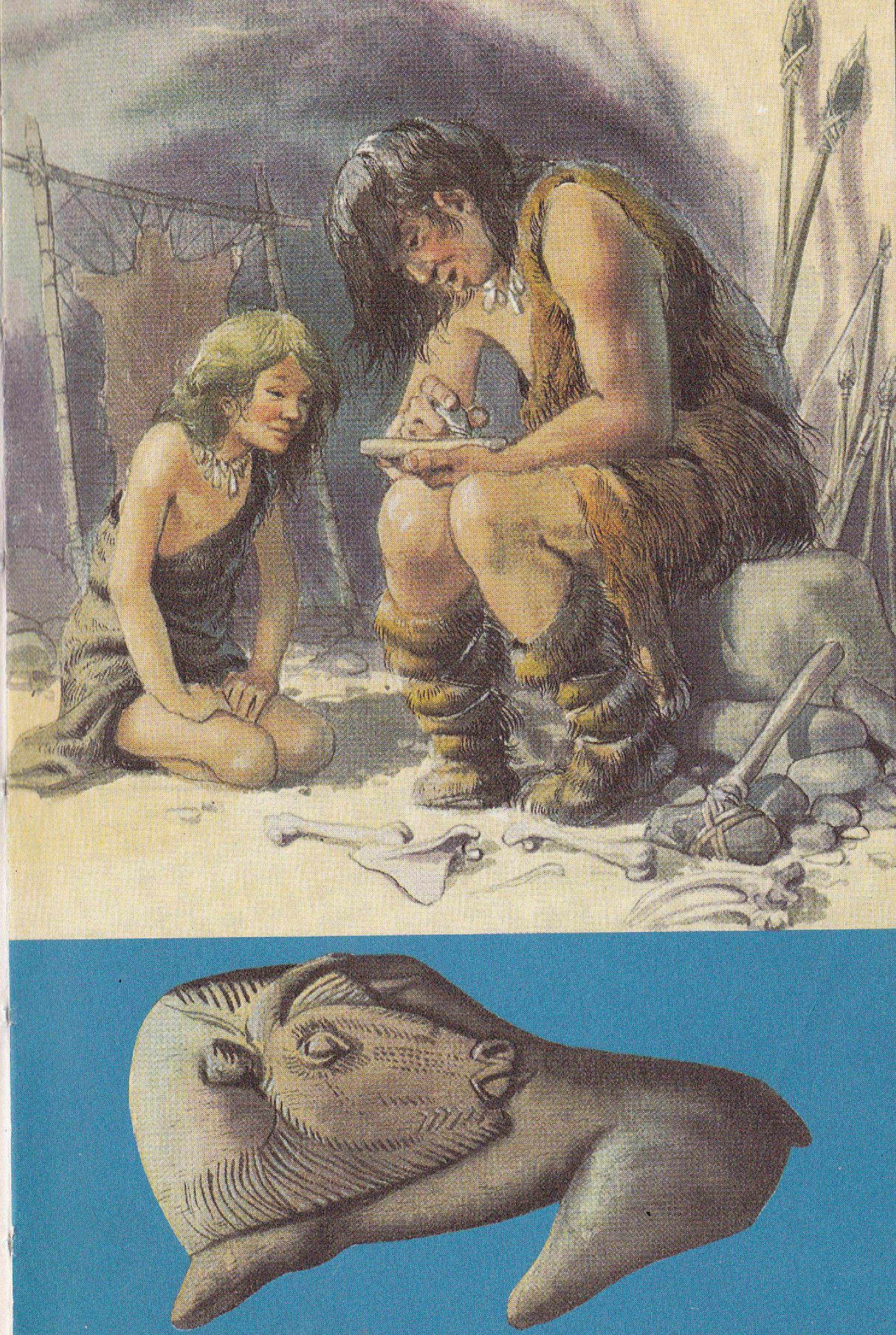


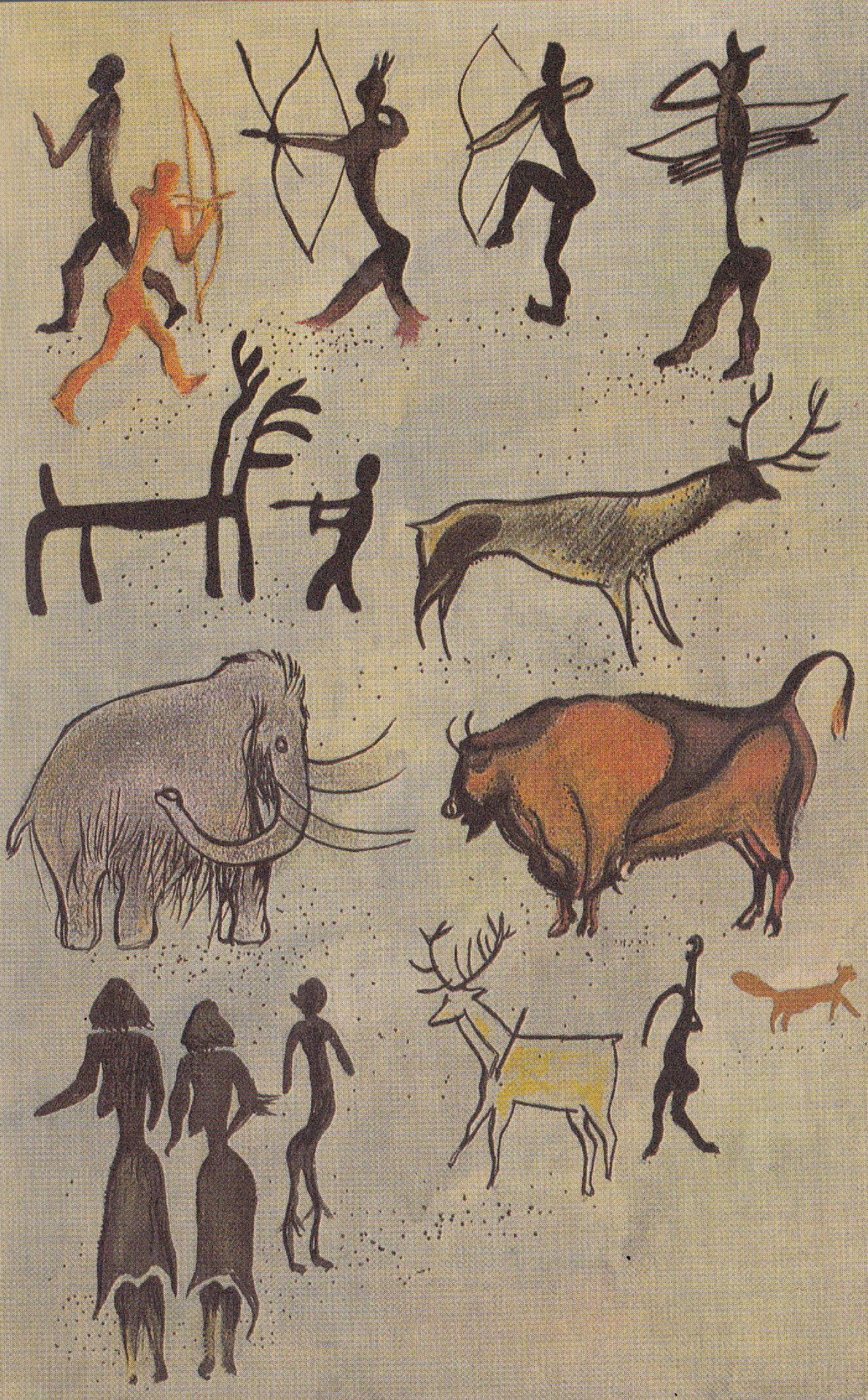
The first known written records

Printing as a craft has been with us for about five hundred years. That sounds a very long time, but the history of man's efforts to report and record events is very much longer. To study this history we need to look back several thousand years.

From the very earliest times, mankind has needed a means of communication. For everyday matters, sign language or a form of speech was good enough. "I want food" or "I am going hunting" were simple enough subjects to get across to another person. Speech does not last, however, and the words spoken were soon forgotten in the hard struggle for survival.

For more important happenings—a life and death fight with a fierce animal perhaps, or a battle with another tribe—early man had a more permanent method of recording his exploits. Symbolic drawings illustrating the event were scratched on tree bark or flat stones, or painted on the walls of a cave, so that the occasion could be remembered and facts preserved for future generations.

Some typical pictures made by cavemen



Developments in the East

The process of drawing pictures to record events of special interest went on for a very long time. The Ancient Egyptians added more colour to their pictures. As well as wood and stone, they used clay tablets for their designs. Impressions could easily be made in soft clay, and when the tablets were baked they became hard and the designs on them became permanent.

As time went by, the designs made by the Egyptians developed into certain shapes which came to represent particular sounds. In this way a set of recognisable symbols for communicating certain ideas was gradually built up.

A development of a different sort was going on in Persia and Babylonia, where symbols were formed by means of a wedge-shaped implement. This was pressed into clay tablets at different angles to produce signs of various shapes and patterns. A large number of these tablets are still in existence today, preserved in museums, and experts have been able to obtain much interesting information from them about those ancient peoples and their way of life.

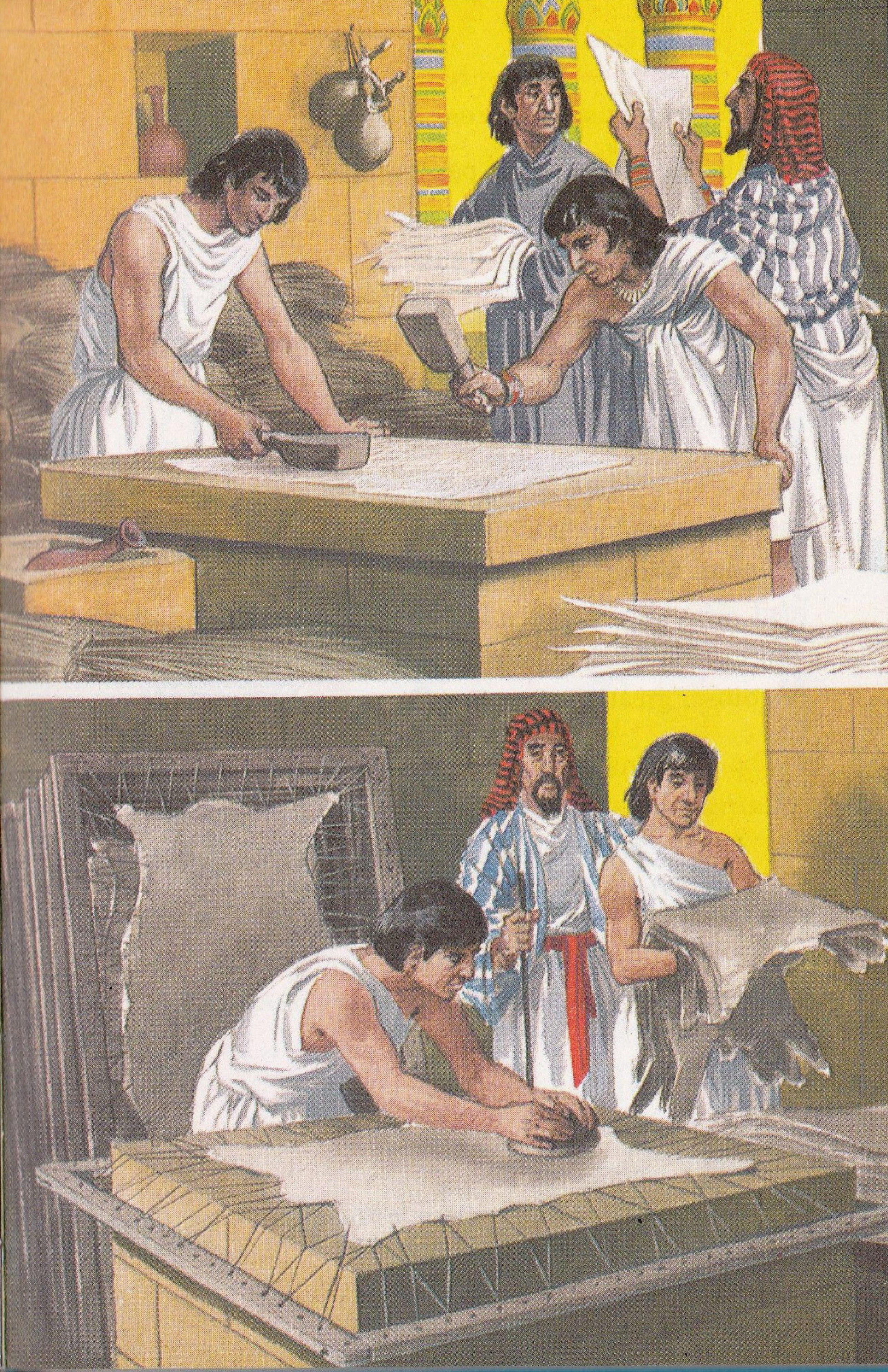
An Egyptian wall picture, showing some of the symbols used for communicating ideas

Materials improve

Wood, stone and clay were difficult and clumsy substances with which to work, and they required a great amount of storage space. This fact eventually led to the invention by the Egyptians of a new writing material known as *papyrus*. It was made from the inner pith of a large species of reed, called the papyrus reed, which grows along the banks of the River Nile. Strips of pith were placed side by side, and a second layer was placed across the first. The strips were glued together and then beaten until they formed a continuous sheet. It was possible to write on papyrus, using a simple reed pen, and ink made from soot, gum and water.

A shortage of papyrus in the region of Pergamum forced the people of that area to find their own writing material. This they did very successfully by using animal skins which they stretched, scraped and polished, and cut up into convenient sizes. The material became known as *parchment*. It was found to be better than papyrus and later took its place.

Above: **Papyrus being beaten during manufacture**
Below: **Polishing parchment**



Writing replaces pictures

With the invention of papyrus and then parchment, a change slowly came over the way people drew their pictures and made their designs and symbols. The new materials were much easier to work on, so designs were made more quickly on them. In time the pictures became less like the old pictures and began to look a little more like a sort of lettering.

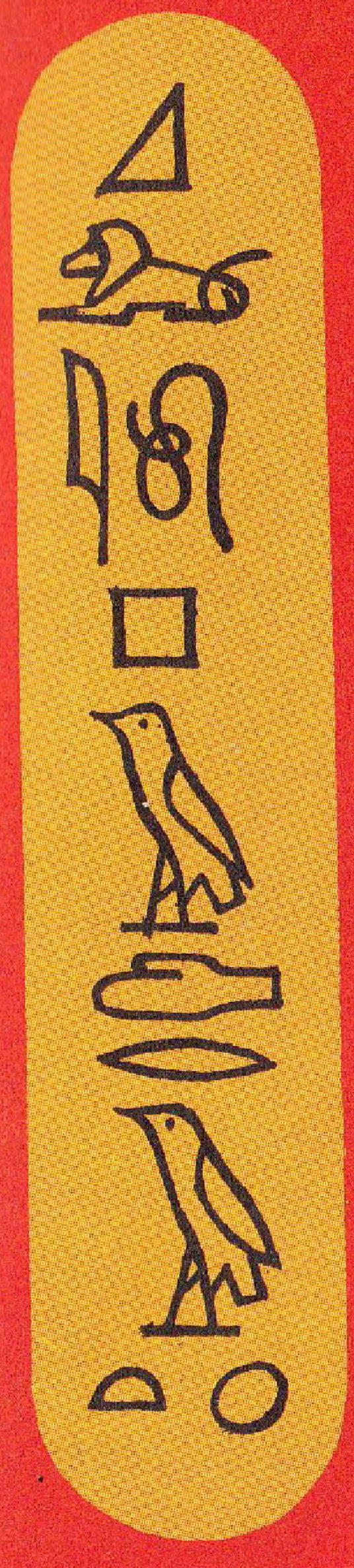
Writing was introduced into Europe by the Phoenicians. They were merchants and traders, and so needed a kind of writing that was quick to produce and easy to read. The letters they used were the first rough beginnings of the ones we use at the present time, although, of course, great changes have been made since then.

The Phoenicians traded with many European countries, and their writing was copied by other people. The Greeks and then the Romans adopted it, and in due course developed their own separate alphabets.

The picture period had gone; writing had come to stay, and communication became very much easier.

The word 'Cleopatra' written in Egyptian hieroglyphics,
 and the Pheonician, Greek and Roman alphabets

EGYPTIAN HIEROGLYPHICS



KLEOPATRA

EARLY ALPHABETS

Phoenician	Greek	Roman
𐤀	A	A
𐤁	B	B
𐤂	Γ	C
𐤃	Δ	D
𐤄	E	E
𐤅	F	F
𐤆	I	G
𐤇	H	H
𐤈	⊟	I
𐤉	K	K
𐤊	L	L
𐤋	ᴧ	M
𐤌	M	M
𐤍	N	N
𐤎	O	O
𐤏	⊓	P
𐤐	Φ	Q
𐤑	Ρ	R
𐤒	Ρ	S
𐤓	Τ	T
𐤔	Υ	V
𐤕	Ξ	X

Alphabets and scrolls

Alphabets grew out of the discovery that all words can be made up of sounds arranged in different groups. Each letter of the alphabet represents a different sound. If the letters are suitably arranged, all the words of a language can be produced. The word 'alphabet' itself comes from the first two letters of the Greek alphabet—alpha and beta.

Writing in Greece and Rome continued to develop. To protect their work from damage, the writers used to attach a wooden roller to each end of the sheet of papyrus or parchment and roll them together. This made what was known as a *scroll*. When anyone wanted to read from a scroll, the ends were rolled apart to reveal the writing. Long scrolls were rolled from one roller on to the other, and back again.

Another form of communication was also used by the Greeks and Romans. They sometimes traced their letters on wax tablets, using a pointed instrument called a *stylus*. Several tablets could be laced together to produce something like a crude kind of book.

A Roman reads from a scroll

The first books

At the fall of the Roman Empire in the fifth century A.D., great numbers of the scrolls and tablets that had been so carefully written were destroyed. Nevertheless, many of them were saved and hidden in monasteries. Some of the scrolls included parts of the Bible and other important works.

The monks now took on the task of writing. They often illustrated, or 'illuminated', the pieces of parchment with drawings and paintings in colour. As the number of pages grew, they were sewn together in sections. This kept them tidy and made them easier to read. Later on, several sections would be collected together and the complete set bound between leather or wood covers. These were the first real books. Most of them were about religious subjects, and the covers were usually engraved and decorated in the most beautiful way. They were very expensive.

For the next thousand years, books continued to be produced in this painstaking way in the monasteries which became the main centres of learning.

A monk writes and 'illuminates' a manuscript

The invention of paper

Today there are many different kinds of paper. There are the rather rough kinds used for newspapers, the smooth, shiny, coated papers used in fine quality printing, and a whole range of different sorts in between. However, it is interesting that the principle on which they are all made is the same as that established by the Chinese inventors nearly two thousand years ago. The exact date is uncertain—probably about 100 A.D.

The Chinese used different kinds of basic materials for their paper-making, such as a species of mulberry plant, grass or wood. The system was to pound the material into a pulp and boil it in water. When the mixture cooled, the fibres of the material were left floating about in the water. A fine sieve was next lowered into the water and then lifted slowly out again. As the water drained away, the fibres clung together on the sieve and formed a thin layer of soggy pulp, which was then pressed between felt to remove excess moisture. When this was dried in the sun, it became a usable sheet of paper.

Paper-making – about A.D. 1500

How printing began

Printing was also invented by the Chinese. The suggested date of its invention is A.D. 594, but nobody really knows how accurate this is.

The early printers used to carve a design or letters in a block of wood. Ink was spread over the carving and a sheet of material—paper, papyrus or parchment—was pressed onto the inked surface. In this way an impression of the raised portion of the carving was transferred to the sheet. Any number of impressions or printings could be obtained from the same block.

All the blocks for the pages of a book could be separately carved and printed like this and the pages bound together to form a complete volume. Once the blocks were made, many copies of the book could be produced. This was a big advance in many ways but, as you can imagine, it used to take an extremely long time to carve all the words and drawings in wood blocks before printing, and book making was still a very slow and expensive process.

Early woodcuts used for printing

The beginning of publishing

Very little serious progress was made in printing for nearly a thousand years. However, as the centuries passed, the Chinese inventions spread gradually along the routes used by merchants and travellers, and finally reached the centres of learning in Europe. Even then most of the books were still written and copied by hand.

By the middle of the fifteenth century, trading had spread and education among the upper and middle classes was slowly improving. More and more people were, therefore, wanting books. Professional writers now added to the output of the monasteries. They produced text-books for students as well as the classical volumes for rich collectors.

In Paris and other university towns of the time, there were so many book and manuscript writers that they were able to get together and form themselves into Guilds. 'Publishing' had arrived! However, in spite of the progress that had been made, books still took a long time to produce, and remained too expensive for many people who wanted to buy them.

Books of the 15th century on display

The great invention

Some time between 1440 and 1450 came the invention which completely changed people's reading habits and advanced their means of communication throughout the civilised world. It was not the invention of printing. This had occurred in China nearly a thousand years before. It was the invention of printing by *movable type*. That is to say, by individual letters made of metal which could be set together to make words, lines and complete pages for a book. When enough copies of a book had been printed, the letters, or type, could be separated again and used in other books. This was much easier, quicker, and cheaper than the old method of carving whole pages in blocks of wood.

The man who made this important and far-reaching discovery was a German named Johann Gutenberg who lived in the city of Mainz. A mirror-maker by trade, he printed the first book ever to use the new movable type. This was a version of the Bible. The machine he used was very like a wine press of that time.

Gutenberg and an early printing press

How Gutenberg made his type

Gutenberg's first job was to carve a master set of letters from which all the pieces of type could be made. To do this he first drew each letter of the alphabet on the end of a short steel bar. He then carefully cut away all the areas around the lines he had drawn until only the raised letter was left. The bar with its letter on the end is called a *punch*. The punch was then held with the carved letter against a smooth piece of copper, and struck with a hammer. In this way a deep impression of the letter was left in the copper. This is known as a *matrix*.

The matrix was next put into a mould and molten lead was poured over it. The lead cooled and set very quickly and when taken out of the mould it had on one end an exact replica of the letter on the punch.

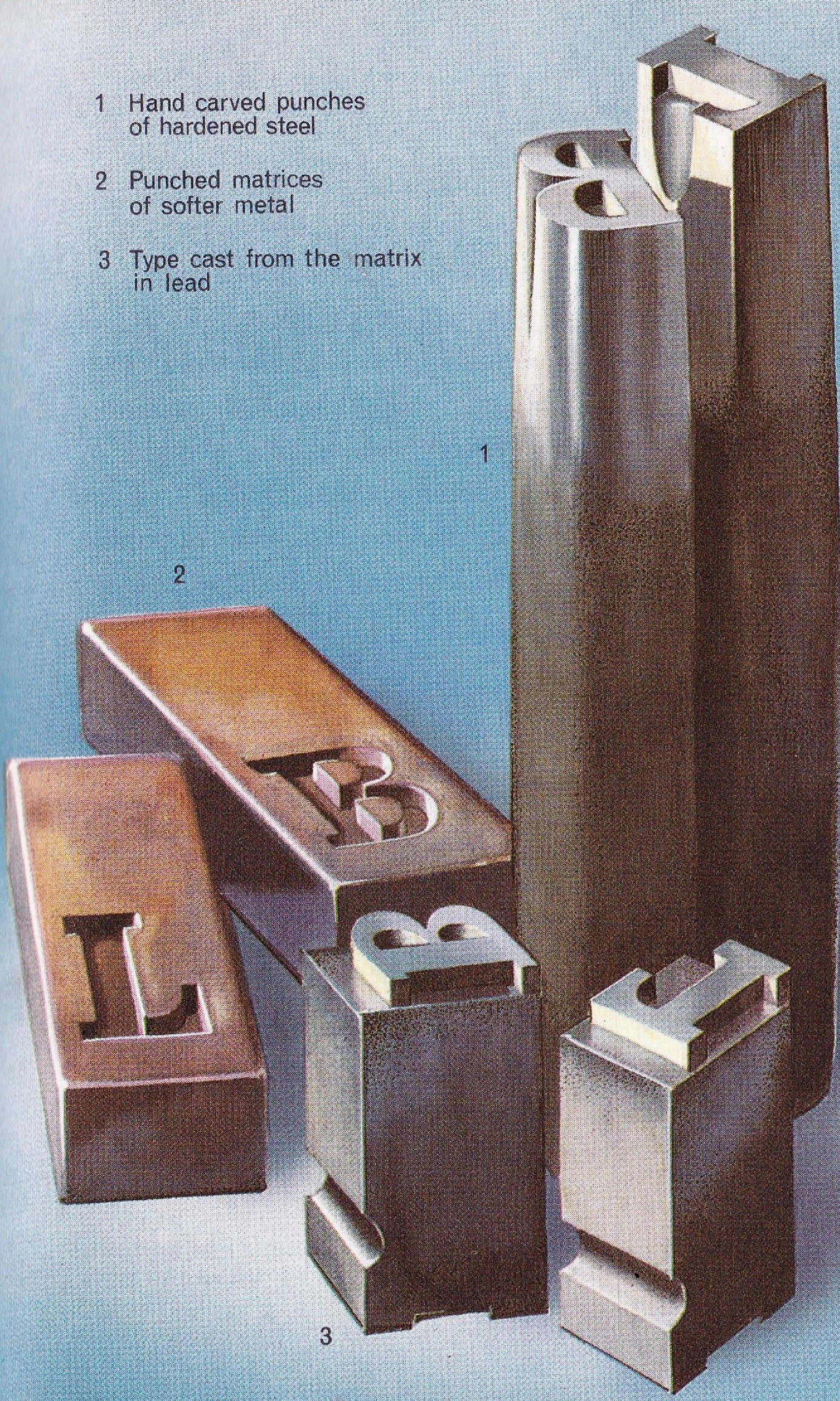
An unlimited number of letters could be *cast* from each matrix and each one was exactly the same as the others.

A punch, matrix and type

1 Hand carved punches of hardened steel

2 Punched matrices of softer metal

3 Type cast from the matrix in lead



Imitating writing

Johann Gutenberg and the other early printers, such as William Caxton, tried to make their books look as much like the written ones as possible. The first types that Gutenberg cut were copies of the heavy Gothic lettering used for so many years by the monastery writers. Compare the two examples on the opposite page; the top one is taken from a letter written by Caxton, while the lower example was printed. As you see, there is a similarity between the two examples, although the letters of the lower, printed page are more regular.

At that time, Latin was the language of religion and learning, and nearly all the early books were written and printed in Latin. Later on, as printing spread throughout the Western World, printers started to produce books in their own languages, and more simple forms of types were introduced, known as Roman types.

In the next fifty years, printing spread rapidly to France, Switzerland, Holland, Spain, Portugal, Poland, Austria, Denmark, Norway, Sweden, Turkey and other countries.

Above: **A reproduction of Caxton's handwriting**
Below: **The same wording when set in the type Caxton used**

In the wrytyng of the same
my penne is worn, my hand
wery and not steadfast· myn
eyen dimmed with overmoche
lokyng on the whit paper·

In the wrytyng of the same
my penne is worn, my
hand wery and not steadf=
ast· myn eyen dimmed with
overmoche lokying on the
whit paper·

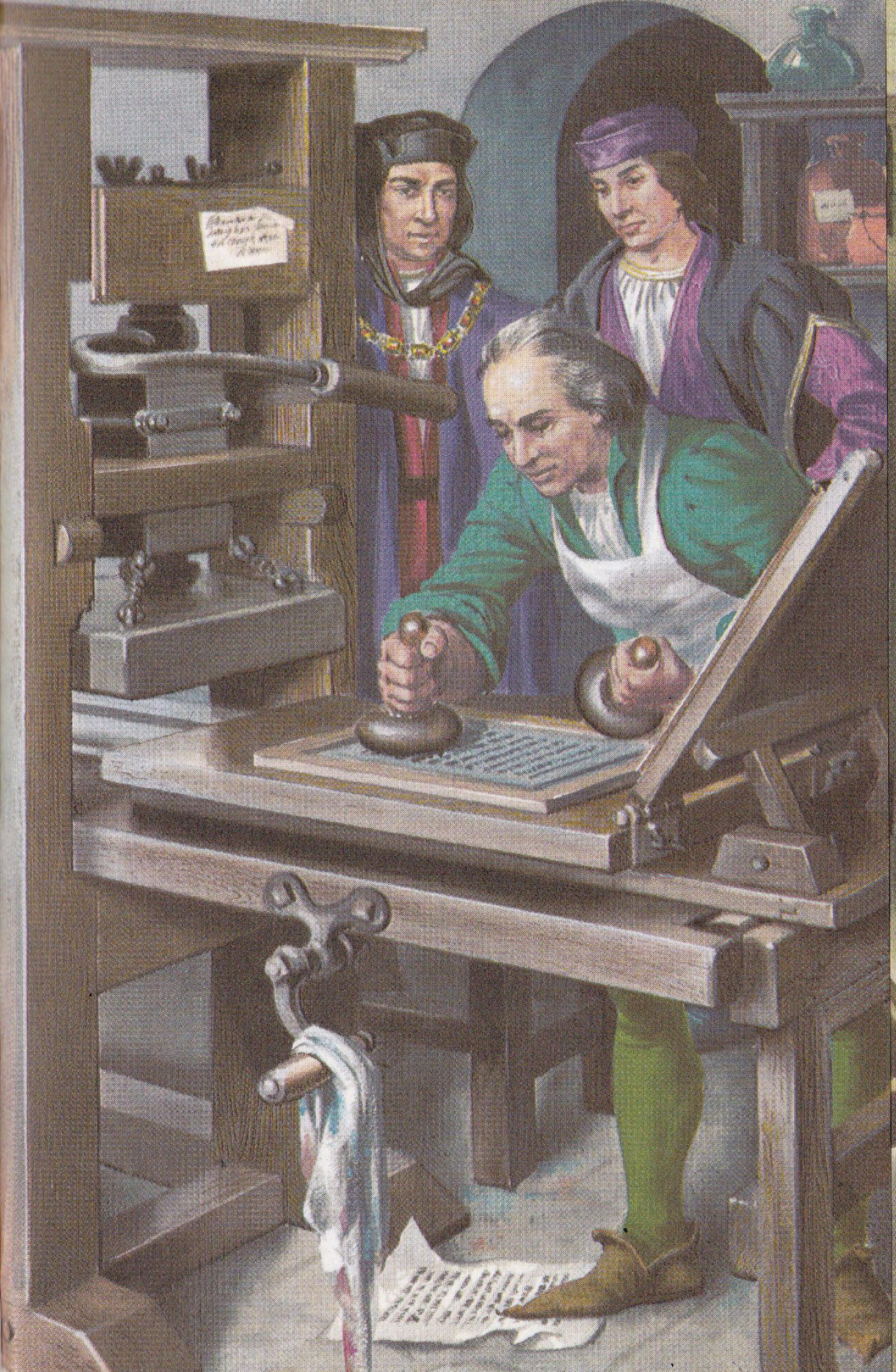
William Caxton

William Caxton was the man who first brought printing to England and the first to print a book in the English language.

He was born in Kent and as a youth served an apprenticeship in the cloth trade in London. After his apprenticeship he went to Burgundy in France where English cloth merchants were carrying on a profitable trade. His business took him to other parts of the Continent as well, and after many years he went to Cologne in Germany. It so happened that Cologne had become one of the first three German centres of printing and it was here that, in 1471, Caxton first picked up some knowledge of the craft.

At about the end of 1472 William Caxton returned to England, bringing with him some of the types he had obtained in Cologne, and in 1476 (at the age of fifty) he set up his printing press in Westminster. Altogether he printed about a hundred books and helped to establish the English language. Two of his earlier works were *Aesop's Fables* and *The Canterbury Tales*.

William Caxton at work



Printing in the seventeenth century

From the earliest days of printing, type was always kept in wooden trays known as *cases*. There were two of these, one positioned above the other on a sloping bench. The upper case held all the CAPITAL letters whilst the lower one contained the small letters. To this day, capitals are known as 'upper case' and small letters are known as 'lower case'. The man who set the type was (and still is) known as the *compositor*. He took the pieces of type out of the cases, made them up into words and then lines in a thin tray, called a *composing stick*, which he held in his hand.

When the right number of lines of type had been put together to form a page, they were locked tightly in a frame and laid on a wooden hand press. Ink was applied to the face of the type with leather pads called *ink balls*. A sheet of paper was spread over the inked type and the process completed by operating the screw of the press. When the screw was released, there was the printed page which was then hung up to dry.

A compositor setting type

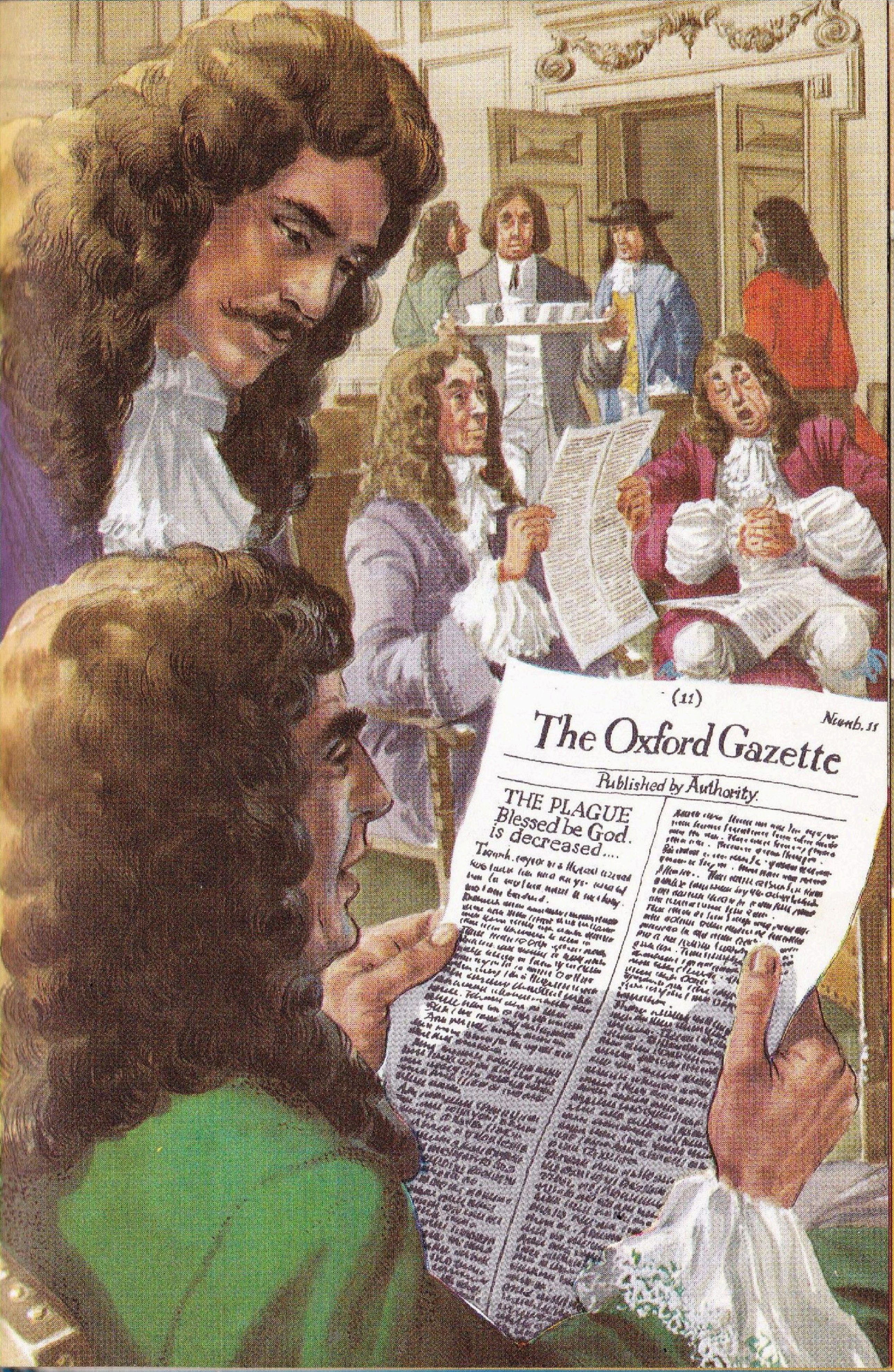
INDIAN BOOKS

The beginning of newspapers

The development of newspapers played a very important part in the growth of the printing trade. In its way it was almost as important as Gutenberg's own invention. Many of the new methods which, as time went on, came to be used in the printing industry started as improvements in newspaper production and were afterwards adopted by the printing trade as a whole.

Newspapers started some time in the early sixteenth century in the form of small one-page leaflets produced at varying intervals. These would contain some item of general interest to the public. During the next hundred years more pages were added and some publications were illustrated by means of engraved wood blocks. The author of *Robinson Crusoe*, Daniel Defoe, started a newspaper while he was serving a sentence in prison.

In 1712 the government of the time brought in a newspaper tax. Until then the papers had been sold at a halfpenny a copy. This price went up to three-halfpence a copy after the tax and as a result, many of the productions had to close down because people would not pay the extra money.


(11)
Numb. 11
The Oxford Gazette
Published by Authority.
THE PLAGUE
Blessed be God,
is decreased....

The Times

The first newspapers were published at odd intervals whenever there was something of special interest to print. The first daily news-sheet was the "Daily Courant" which was first published in 1702 as a single sheet. In the second half of the same century, advertisements began to appear. The first of these were for "Missing Persons"—usually servant girls who had run away from their employers. Later there were advertisements for items such as tea and medicines, and for wives, husbands and slaves.

As trade and education improved, more and more newspapers were wanted. The "Daily Courant" was followed by other dailies. In 1785 "The Daily Universal Register" was started. Three years later it was renamed "The Times" and eventually became the newspaper we know so well to-day. It is interesting to note that "The Times" is still printed on the same site on which stood the printshop where the very first edition was produced nearly two hundred years ago.

Newspaper printing continued to expand throughout the eighteenth and nineteenth centuries.

Newspapers become more and more popular towards the end of the 18th century

New machinery

Towards the end of the eighteenth and the beginning of the nineteenth century, the demand for newspapers and printing of every kind had grown so much that new ways had to be found to speed up and improve production. For three hundred and fifty years, ever since Gutenberg first produced a printed sheet on his wooden hand press, printing had been done by hand on similar wooden presses. Now, big changes were about to take place.

In 1800, the Earl of Stanhope designed the first hand press with an iron frame. Stanhope deliberately refrained from patenting his design, so that the printing trade might have free use of it. It was practical and efficient, and its new system of levers controlling the impression made it easier to operate. It rapidly replaced the wooden press.

A power-operated press was invented by Walter Koenig, and first used in 1811. It was driven by a steam engine and printed four hundred sheets an hour. Inking by leather pads, or ink balls, gave way to inking by an arrangement of rollers. This is the method used on modern printing presses.

An early metal-framed printing press

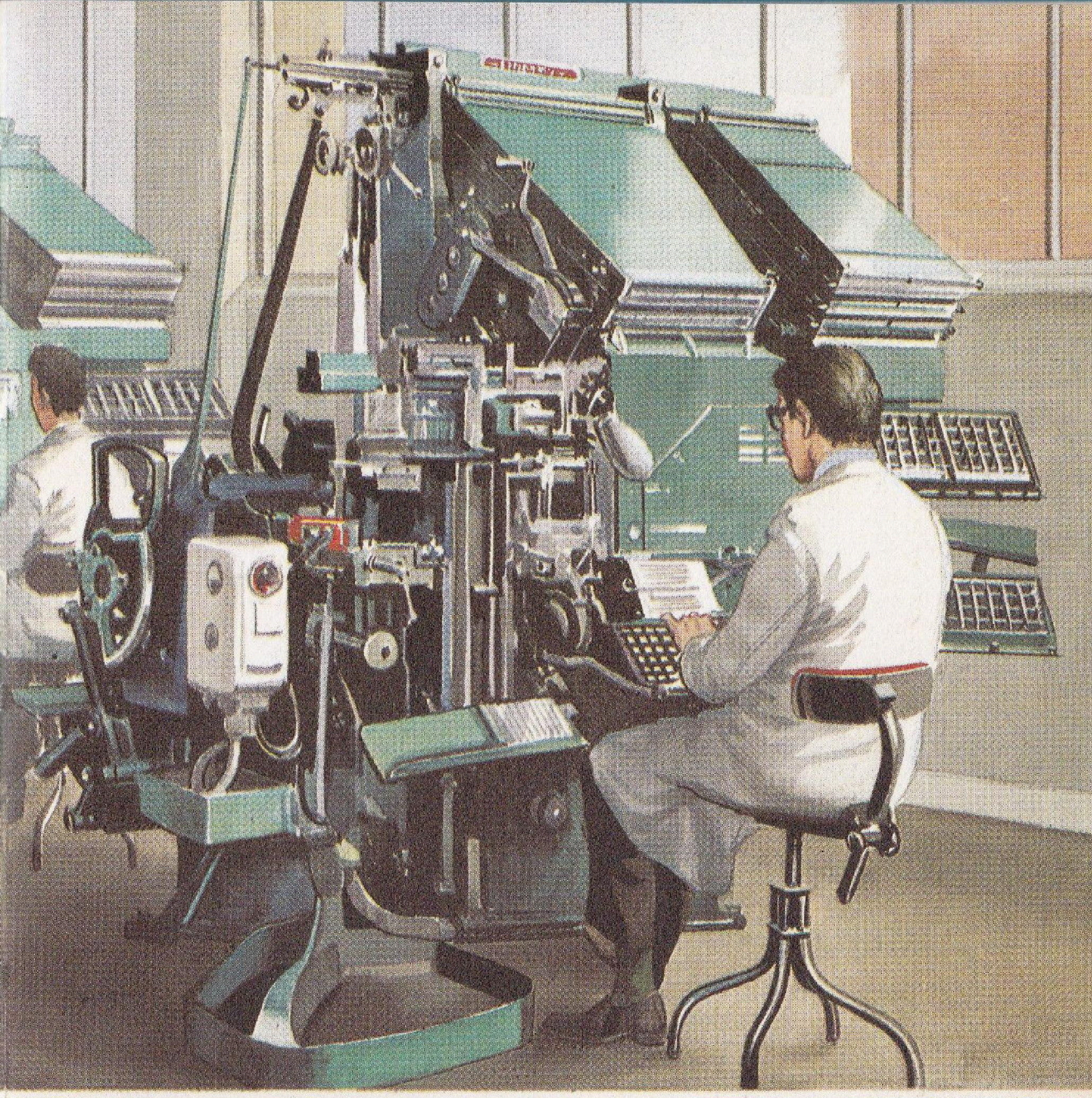
Faster type-setting and paper-making

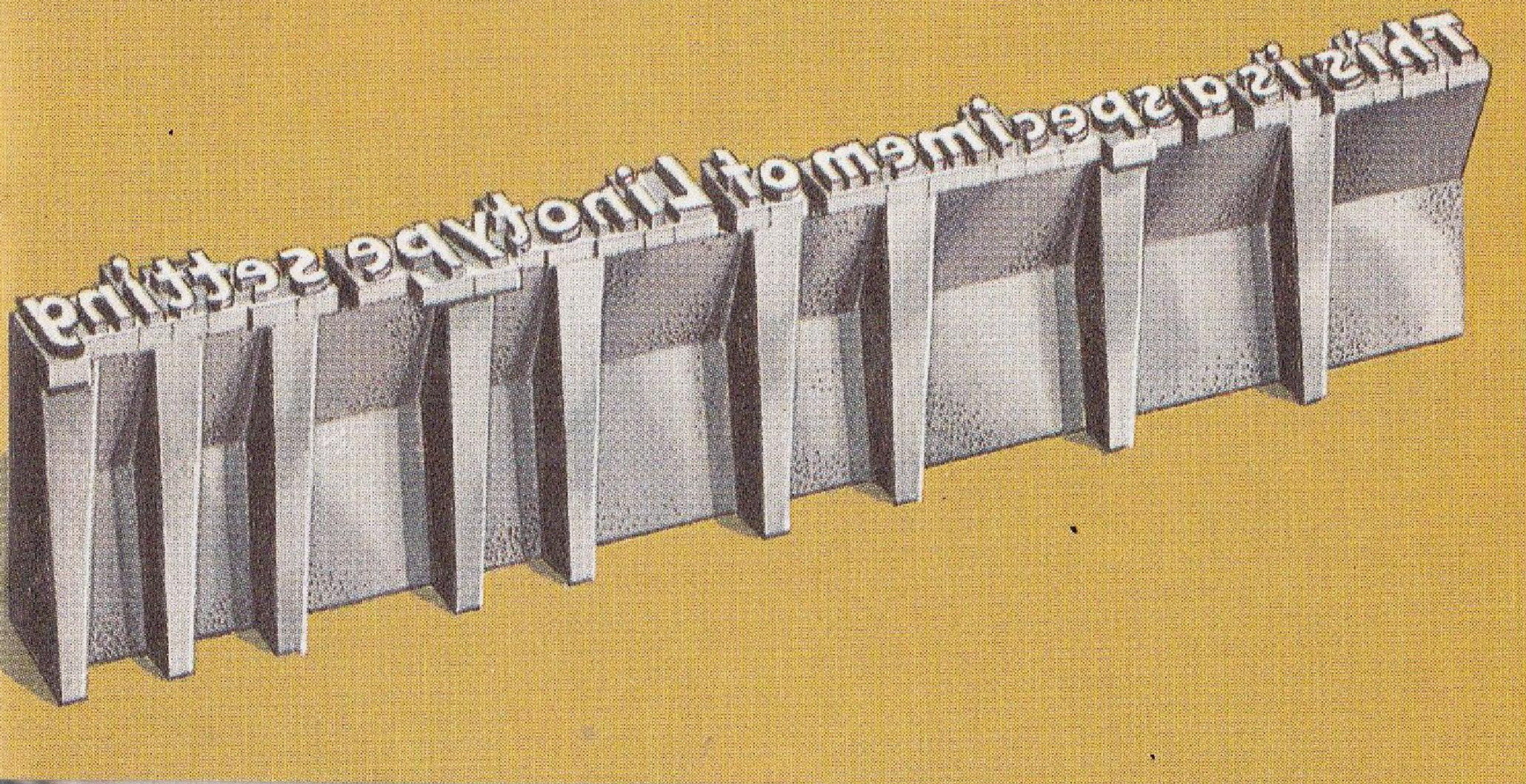
Other aspects of the printing craft changed to keep pace with the advance of the actual printing process.

Paper was still being made by hand in single sheets at the beginning of the nineteenth century. But in 1803, a machine was produced which could make the paper continuously as a long strip which was wound on to a reel. The materials used were woodpulp, and *esparto* grass from Spain and North Africa for smoother, better quality papers.

Type-setting by hand, from cases to the composing stick, was becoming too slow to meet the needs of the ever-increasing demand for printed matter. The first type-setting machine, called the *Linotype*, was invented in 1890. The compositor pressed keys like those on a typewriter and the machine automatically cast solid lines of type. This machine was able to cast at the rate of 17,000 letters an hour. Later, in 1899, the *Monotype* caster was introduced. It was similar to the Linotype but cast the letters as individual pieces of type instead of complete lines.

An operator casting type on a Linotype machine




This is a specimen of Lino Type setting

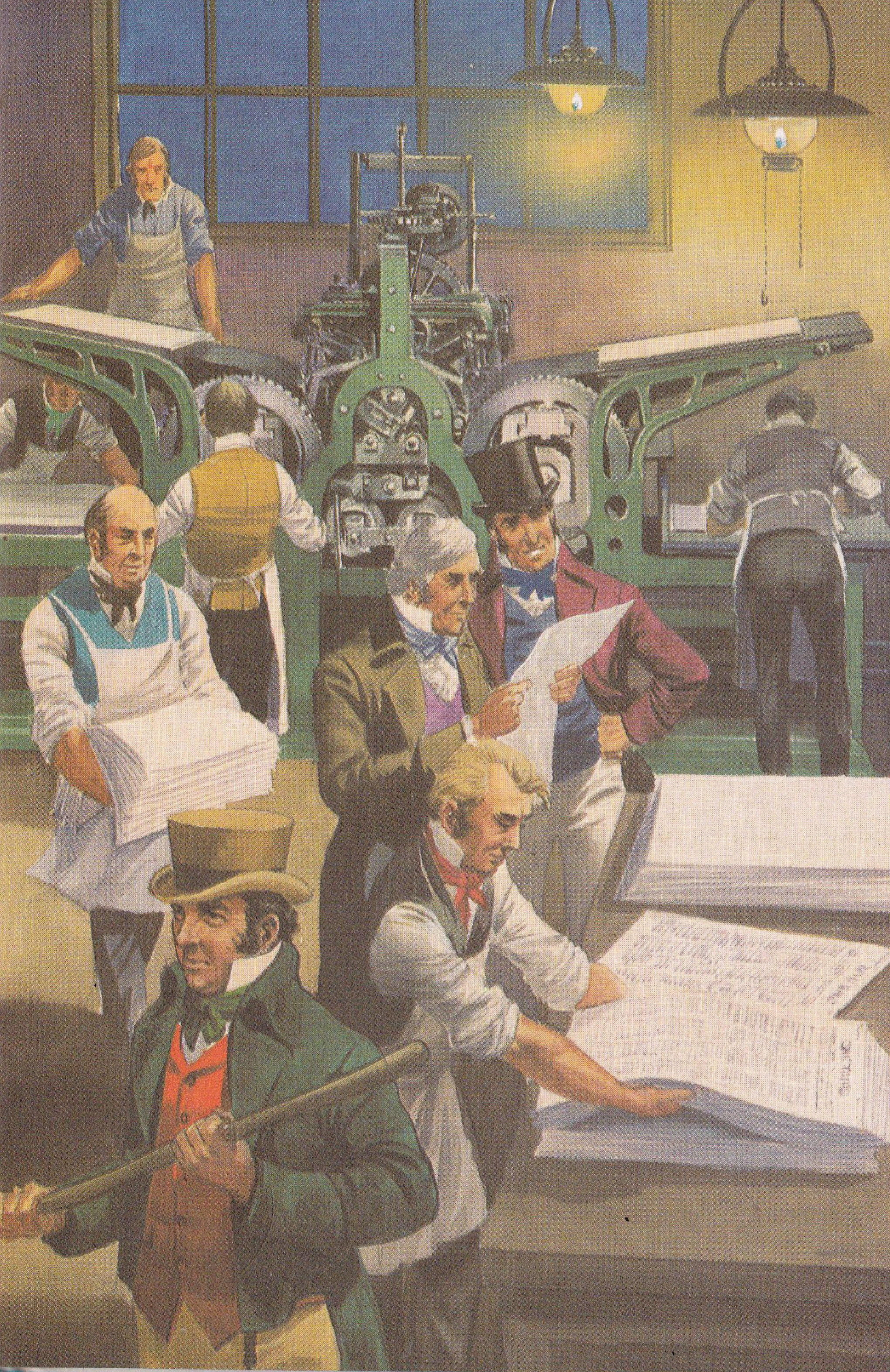
New inventions and their effects

Numerous inventions and improvements followed those that have already been mentioned. Most of them would take too long to describe and, in many instances, are rather technical and complicated.

The cylinder press was invented; this was able to produce 2,500 newspapers an hour, printed on both sides. By 1865, rotary presses using curved printing plates were in operation, and at the turn of the century multiple-unit rotary presses were turning out many-paged newspapers at the rate of twenty to thirty thousand copies an hour. Indeed, the great printing industry as we know it today was becoming established.

But it was not all plain sailing. The men working in the printing factories were naturally worried lest the new and faster machines would mean that their jobs might be affected. This was a real fear because, as the processes became more efficient, fewer people were required to operate them. At times the situation was so uneasy that some of the latest inventions had to be tried out in secret in case men might sabotage the machinery.

A new and faster machine for newspaper production in 1814



Lithography

While fairly steady progress had been made over the years in printing from type, the printing of pictures and designs had always been a more difficult problem. The process of engraving on wood or metal blocks did not alter for about three hundred years. It was a slow process and tended to hold up the printing of a book.

The first real breakthrough came with the discovery of *lithography* by a Bavarian named Alois Senefelder, in 1786. It was first used in Britain in 1800. In this process, the drawing or design was merely sketched on a stone. No engraving or carving was required. The principle of printing by this method is based on the fact that oil and water do not mix. On the stone, the image to be printed is treated with a greasy substance, the other areas of the stone being moistened with water. The ink takes to the treated portions, and the impressions are transferred to the paper. The moistened parts will not accept the ink and, therefore, remain blank.

Today, metal plates are used instead of stone.

A lithographer inking an image on a litho stone

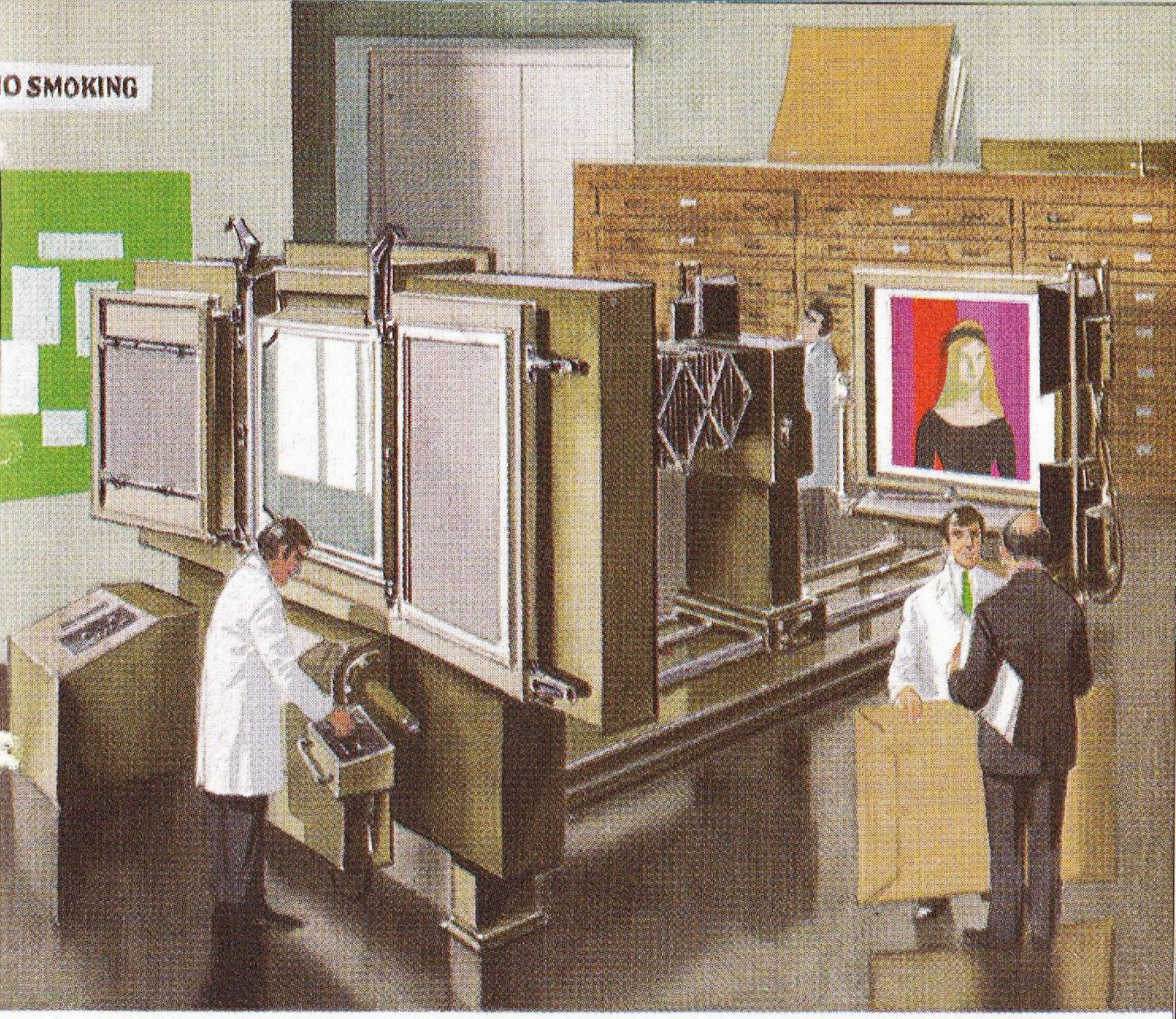
Photography and other forms of printing

Printing from type and other raised surfaces, such as engraved blocks, is known as *letterpress* printing. Lithography (or litho, to give its shortened name) is a method of printing from a smooth surface, as we explained in the previous chapter. The third well-known kind of printing is *photogravure*, which was introduced toward the end of the nineteenth century, and is a means of printing from *below* the surface of the plate. Newspaper colour magazines and most of the women's magazines are printed by photogravure.

The invention of photography by Fox Talbot, in 1835, was to be of great help to the printers, especially in the reproduction of pictures. Drawings could now be photographed by special cameras and the image photographically transferred to the block or plate from which it was to be printed.

Photography also helped in the development of colour printing. All the colours in a painting can be separated into the three primary colours of yellow, red and blue, and photographed onto separate plates. Black is added in printing to give extra contrast.

Above: **A camera with colour filters separates the colours of an illustration**
Below: **The primary printing colours – red, yellow and blue – and some of the colours they produce together**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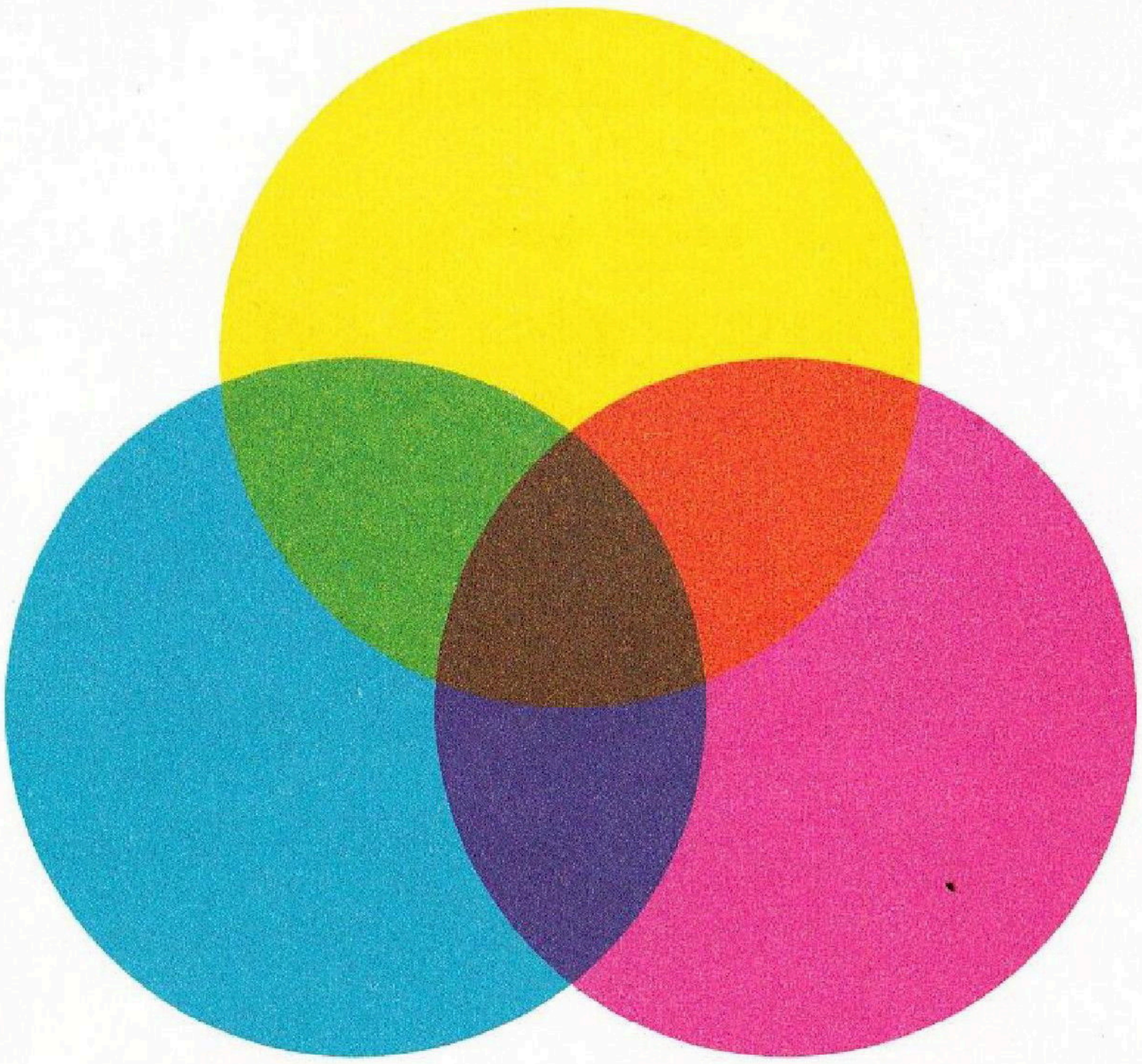


The universal communicator

Right through the ages, civilisation has advanced with the growth and spread of printing. Nowadays we get news from printed newspapers and magazines, entertainment from printed stories and pictures. We learn a great deal at school from printed books. When we want to buy something expensive like a transistor radio, a television set or a motor car we usually ask for the printed catalogue to get all the information about it. We probably pay for it with printed banknotes or a cheque. The radio itself might even have a printed electrical circuit! We are not allowed to ride in a train or on a bus without having a printed ticket and we certainly must not drive a motor vehicle without a printed driving licence. Imagine a supermarket with no printing on all the hundreds of different packets to tell us what is inside! No doubt you can think of many more examples of the use of printing.

Every day of our lives we come into contact with printing in one form or another. It is the most universal of all methods of communication. Can you imagine what life would be like without it?

EVENING POST

MAN ON MARS

Russians to free the Smiths

WIZZO SOAP FLAKES

A LADYBIRD BOOK

GREAT ARTISTS

BOOK 1

ROYAL LAGER

Bach

Johann Sebastian

Stereo

NEW SUNNY ORANGE ADE

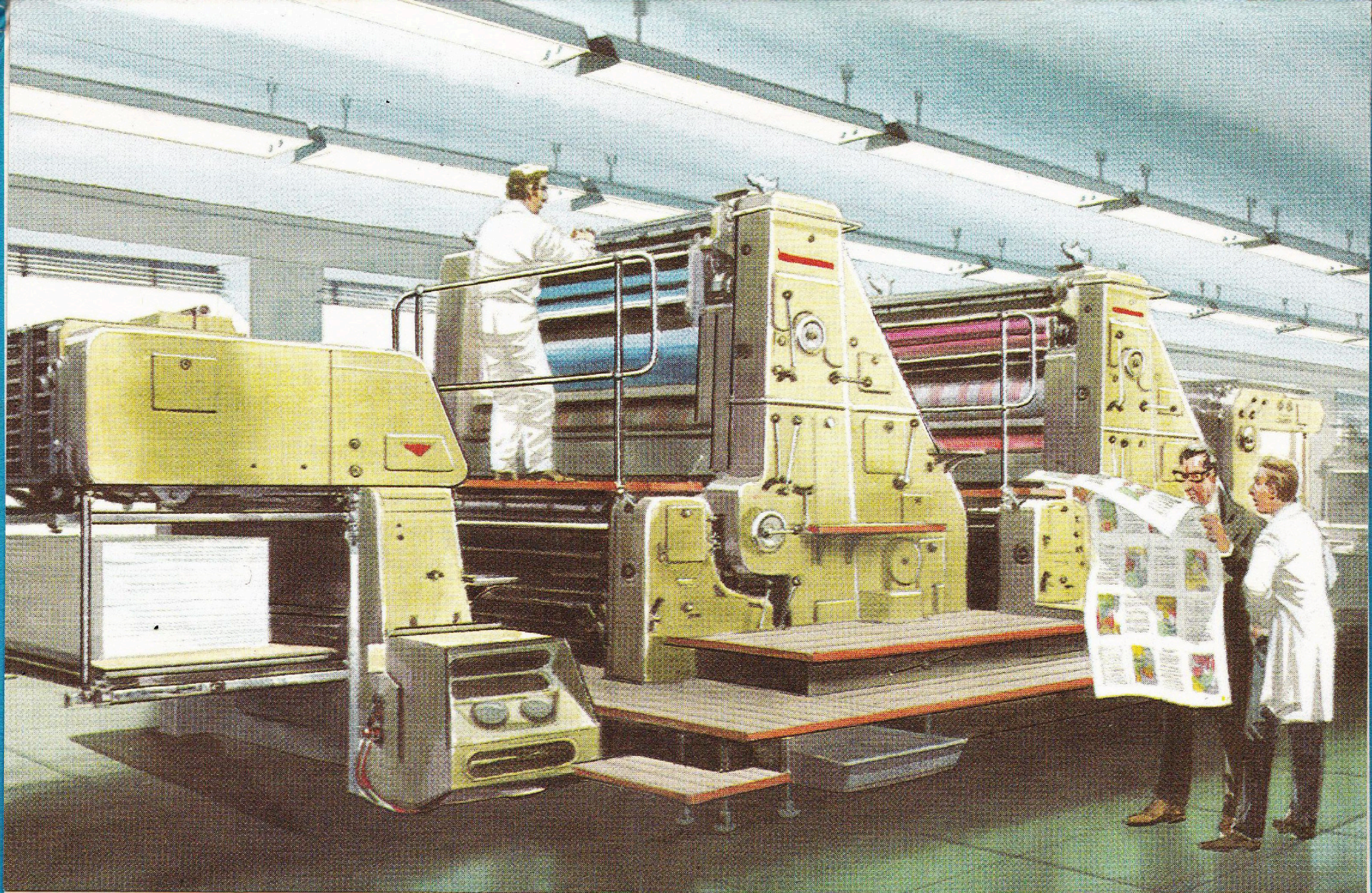
How this book is printed

This book is printed in four colours by lithography. The paintings for the illustrations go to the platemaker. Here they are photographed by large cameras. By using special filters the camera operator separates the colours into the three primary colours of yellow, red and blue—plus the extra black. An image of each colour is then transferred onto separate metal plates.

While this is happening, the type is being cast and made up into pages. It is *proofed* on paper and checked for mistakes. Printings of the type then also go to the platemaker. He photographs them and transfers the image of the type onto the plate which will print the black colour.

The four printing plates are then placed in a large machine similar to the one in the picture, and each plate revolves on a separate *cylinder*. The correct colour is applied to each plate by means of *ink rollers*, and all four colours are printed onto one side of the sheets of paper as they pass through the machine. They then pass through the machine again so that the other side of the sheets can also be printed in four colours. When the sheets have been printed on both sides, they are cut, folded, sewn together, trimmed to size and put into previously made-up covers.

One of the huge colour-printing machines used to print Ladybird books



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